# **REVIEW**

# by Prof. Dr. Todorka Atanasova Glushkova

Faculty of Mathematics and Informatics, Plovdiv University "Paisiy Hilendarski" of a dissertation for the award of the educational and scientific degree " **doctor** " by:

Field of higher education 4. Natural sciences, mathematics and computer science; Professional field 4.6. Informatics and Computer Science; Doctoral program : Informatics

Author : Miroslav Trendafilov Trankov

**Topic** : Application of machine learning methods in textile fiber production **Scientific supervisors** : Prof. Dr. Emil Hadzhikolev and Assoc. Prof. Dr. Silvia Gaftandzhieva, Plovdiv University "Paisii Hilendarski", Plovdiv

### 1. General description of the materials presented

By order of the Rector of the Plovdiv University "Paisii Hilendarski" No. RD-22-771 of 27.03.2025. I am appointed as a member of the scientific jury in the procedure for the defense of a dissertation on the topic "Application of machine learning methods in the production of textile fibers" for the acquisition of the educational and scientific degree 'doctor' in the field of higher education 4. Natural sciences, mathematics and informatics; professional field 4.6. Informatics and computer science; doctoral program Informatics.

The author of the dissertation is Miroslav Trendafilov Trankov - a full-time doctoral student at the Department of Computer Informatics, with scientific supervisors Prof. Dr. Emil Hadzhikolev and Assoc. Prof. Dr. Silvia Gaftandzhieva from Plovdiv University "Paisii Hilendarski" (PU).

The presented set of materials is in accordance with Art. 36 (1) of the Regulations for the Development of the Academic Staff of the University of Plovdiv and includes the following documents:

- Request to the Rector of the University of Sofia to open the procedure for the defense of a dissertation;
- 2. European format CV;
- Transcript-excerpt from protocol No. 18/12.03.2025 of the department council of the Department of Computer Informatics, related to reporting readiness for the opening of the procedure and preliminary discussion of the dissertation work;
- 4. Abstracts (in Bulgarian and foreign languages);

- 5. Declaration of originality and authenticity of the attached documents;
- 6. Certificate of compliance with minimum national requirements;
- 7. List of scientific publications;
- 8. Dissertation;
- 9. Copies of publications on the topic of the dissertation;

The submitted documents are precisely formatted and arranged in accordance with the attached list. The PhD student has attached 4 publications on the topic of the dissertation work. A reference for compliance with the minimum national requirements shows that there are 2 publications on the topic of the dissertation research, which are indexed in SCOPUS and have SJR. The total number of points is 60, with a required minimum number of points of 30, according to Art. 24. (1) and Art. 25 of the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria (latest amendments and supplements SG No. 15 of 19.02.2019).

### Brief biographical data about the doctoral student

I do not know the doctoral candidate personally. According to the CV provided to me, Miroslav Trankov was born in 1986. From 2012 to the present, he has worked in several companies as a system administrator and data administrator, and since 2018 his work career has been related to the textile industry in Züdvolegrup Italy EAD - Bulsafil KCHT branch. He holds a Master's degree from the Paisii Hilendarski University of Technology with a professional qualification in Software Technologies, as well as a Master's degree in Psychology since 2011. Since 2019, he has been studying in the doctoral program in Informatics at the University of Plovdiv. Everything mentioned above is in line with the topic of the dissertation work and shows the necessary competencies for acquiring a scientific and educational degree of Doctor in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6 Informatics and Computer Science, doctoral program Informatics .

# 3. Relevance of the topic and appropriateness of the set goals and objectives

The dissertation work is aimed at studying a current topic - research and application of machine learning methods in the production of textile fibers. The main goal of the dissertation research is to design and develop a prototype of a software system for automating production planning using machine learning methods. Four main tasks have been set, the solution of which is directly related to achieving the main goal. I have no comments on these main tasks and I believe that their solution requires high competence and significant knowledge in the subject area under study.

### 4. Knowing the problem

Knowledge of the research problem is evident not only from the way in which the doctoral student has presented the main theses, but also from the analysis of the literary sources necessary for the development of the dissertation work (182 in number, of which 37 are Internet sources).

The review of the cited literature allows us to claim that the doctoral student is familiar with the issue to a considerable extent. The dissertation is dominated by publications from recent years, which is fully justified, given the current trends and the rapid development of artificial intelligence in the digital era. There are 4 publications on the topic of the dissertation, of which 2 are indexed in SCOPUS and/or Web Of Science and have SJR. One of the publications has a quartile of Q4. Three of the publications are in collections of scientific papers from conferences and one is published in a scientific journal. The doctoral student also has 4 participations with reports in international and national scientific forums. He has participated in the implementation of three scientific research projects.

The above gives me reason to describe the research conducted by the doctoral student as thorough, as well as the good knowledge of the researched problem.

### 5. Research methodology

The results presented in the dissertation testify to the choice of a methodologically correct approach to achieve the objectives of the study. When solving the forecasting task, a methodology was chosen that includes an iterative process over time, which goes through the following several stages - data collection and processing, study of solution methods, solution and prototyping, analysis and evaluation of the results obtained. The chosen research methodology allows achieving the set goal and obtaining an adequate answer to the tasks solved in the dissertation work.

### 6. Characteristics and evaluation of the dissertation work

The dissertation consists of a list of figures, a list of tables, a list of abbreviations used, an introduction, four chapters, a conclusion, an appendix, a list of literature used and a declaration of originality. The main text of the dissertation consists of 150 pages and is accompanied by one appendix with parts of the code of the software implementation. The text is appropriately illustrated with figures (52 in number), tables (11 in number) and diagrams. Each chapter ends with a conclusion presenting the results obtained in the chapter, which facilitates the understanding of the text. The style of presentation is clear and correct.

The **introduction** provides a brief retrospective of currently known facts and technologies related to the topic of the dissertation. The motivation for conducting this research is argued. The

relevance and significance of the topic under consideration is justified. The object and subject of the scientific research are presented, the goal and objectives of the dissertation are defined.

In **the first chapter** "Review of research in the field" the main concepts of the studied subject area are examined - the main technological steps in the production of textile fibers, types of textile fibers and technological characteristics, classical approaches to production planning, production defects, quality assurance standards. Machine learning models and their possible application for improving the processes for the production of textile fibers are studied, with practical applications illustrated with examples.

**Chapter 2.** "Design of a software system for managing the production process in a textile fiber factory" describes the process of designing a software system for managing the production process in a textile fiber factory. Based on the analysis, the functional and non-functional requirements, user roles and their main activities have been determined. The architecture of the software system and the data model have been proposed. The main components of the system and the relationships between them, modules and classes, processes, algorithms, etc. have been described. The main activities in which machine learning methods can be applied have been identified. Based on a detailed analysis, a selection of techniques and technologies for developing the system has been made.

In **Chapter 3.** "Software Implementation presents the developed prototype of a software system" the developed modules for Production Control, Production Organization, Statistics and Machine Maintenance are described in detail.

The developed software system has been implemented in the company Südvole Group Italy branch of Bulsafil KCHT EAD for planning the production of textile fibers. The last **Fourth Chapter** "Experiments" describes experiments from its testing, which prove its applicability for optimization of the production process.

The **Conclusion** summarizes the tasks set and solved within the framework of the dissertation research. The contributions are described, and the prospects and directions for future continuation of the research are outlined. The conclusion also presents a table in which the contributions of the dissertation work, the solved tasks and the relevant sections of the dissertation text, in which the obtained results and contributions are presented, are compared and systematized.

# 7. Contributions and significance of the development for science and practice

On page 135 of the dissertation, the author makes a self-assessment by formulating five contributions – two scientific and applied and three applied – that he has achieved in his work. **I** accept the contributions formulated in this way as follows:

Scientific and applied contributions

- NP1. Proposed architecture of a software system for managing the production process in a textile fiber production factory;
- NP2. Implemented software prototype of a software system for managing the production process in a textile fiber production factory.
  - Applied contributions
- P1. Implementation of the developed prototype of a software system in the company Züdvole Group Italy Bulsafil KCHT EAD branch
- P2. Conducted experiments to test the developed system modules;
- P3. Experiments conducted for automated report generation and notification sending.

### 8. Assessment of dissertation publications

The author has provided a list of 4 publications related to the topic of the dissertation. We can make the following analysis of these publications:

- All 4 articles are co-authored, with the PhD student being the first co-author.
- 2 of the publications are in English and two in Bulgarian;
- Three of the publications have been presented at national and international conferences, one of which was published in AIP Conference Proceedings, referenced in WoS, SCOPUS SJR=0.15.
- One of the publications is in the Journal of Theoretical and Applied Information Technology, with SJR=0.17 and quartile Q 4.

I accept the report prepared by the doctoral student for the fulfillment of the minimum national requirements, according to which two of the publications are evaluated at 30 points each. Thus, the total is 60 points, which is above the required minimum of 30 points. The publications provided confirm the results of the scientific research presented in the dissertation.

## 9. Personal participation of the doctoral student

I do not personally know the doctoral student Miroslav Trendafilov Trankov, but from the materials presented, I believe that he is a well-prepared and competent specialist, a successful participant in research projects, and a professional with experience in the field of machine learning and artificial intelligence. This gives me reason to assume that the formulated contributions and obtained results are his personal merit.

I cannot give an assessment of the personal participation in the publications related to the topic of the dissertation and the participation of the doctoral student, since I was not provided with separation protocols between the co-authors. In such a case, we assume that the participation of each of the co-authors is equal.

# 10. Autor's abstract

The abstract is 32 pages in Bulgarian and English. I have no critical remarks about the content and quality of the abstract. In terms of volume and content, it meets the requirements for accurate, complete and concise coverage of the main scientific and applied scientific and applied contributions described in the dissertation work. It has been prepared in accordance with the requirements of the Regulations on the conditions and procedure for acquiring scientific degrees and for occupying scientific positions at the Paisii Hilendarski University.

## 11. Critical remarks and recommendations

The set of materials and documents provided is complete and correct. In technical attitude the dissertation work is good The content is illustrated with sufficient and well- formatted figures, graphs, and tables. The research is enough voluminous and encompassing the essential aspects on The presentation of each chapter of the dissertation ends with conclusions and a conclusion. The table presented in the conclusion with links between contributions, tasks, place of description in the dissertation work, publications and reports makes a good impression.

They can be send critical notes to the organization on the cited literary sources . The attached style on citation without numbering does difficult tracking them , especially at such big number sources . In addition, some Internet sources lack the date of the site visit. When citing some sources, some of the attributes are missing or unclear (e.g. " Harding, JA, Shahbaz, M, Kusiak, A. (2006). Data mining in manufacturing: a review. Journal of Manufacturing Science and Engineering, 969–976" - missing vol., issue, DOI, ISSN etc.).

PhD student realistically formulates the future use and development of the dissertation results. As a recommendation, I think that in the future the experience and results of the doctoral student's scientific work should be presented in independent publications.

### 12. Recommendations for future use of the dissertation contributions and results

The doctoral student analyzed the results obtained and argued the need and directions for future research on the topic.

#### CONCLUSION

The dissertation **contains** *scientific-applied and applied results that represent an original contribution to science* and meet all the requirements of the Act on the Development of the Academic

Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Act and the relevant Regulations of the University "Paisii Hilendarski".

The dissertation shows that the doctoral student Miroslav Trendafilov Trankov **possesses** indepth theoretical knowledge and professional skills in the scientific specialty of Informatics and Computer Science, demonstrating qualities and skills for independently conducting scientific research.

Due to the above, I confidently give my *positive assessment* of the conducted research, presented by the above-reviewed dissertation, abstract, achieved results and contributions, and *I propose to the esteemed scientific jury to award the educational and scientific degree ''doctor''* to Miroslav Trendafilov Trankov in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6 Informatics and Computer Science, doctoral program Informatics.

20/04/2025

Reviewer: .....

( Prof. Dr. Todorka Glushkova )